8960 Fading with the PXB

The PXB can connect with an Agilent E5515C/8960 Wireless Communication Test Set to form a complete solution for performing faded signal tests on cdma2000[®], 1xEV-DO, W-CDMA/HSDPA and GSM/GPRS/EGPRS mobile devices by integrating the base station emulation and measurement capability of the 8960 Wireless Communications Test Set with the digitally generated channel impairments generated by the N5106A PXB baseband generator and channel emulator.

System Requirements

8960 Lab and Test Applications

8960 Output Power

8960 Fading Measurement Example

8960 GPIB Connection and Remote Operation

System Requirements

8960 requirements:

- Option 004 (Digital Bus)
- a supported <u>8960 lab application</u>

PXB requirements:

- PXB firmware version 1.6 or later*
- at least one I/O card
- at least one baseband card
- N5106A-8FP Connect to E5515C (8960)
- N5106A-QFP Fading with SISO Channel Models
- N5106A-JFP Calibrated AWGN (optional/recommended)
- * PXB firmware version 1.5.3 supports only the E6703 lab application.

8960 Lab and Test Applications

The PXB currently supports the following 8960 Wireless Communications Test Set applications:

<u>Model</u>	Description	Firmware Version
E1962B*	cdma2000 Mobile Test App	B.16.12 or later
E1966A*	1xEV-D0 Terminal Test App	A.11.12 or later
E1987A*	Fast Switch Test App Supports: cdma2000 1xEV-D0	A.10.12 or later
E6701G	GSM/GPRS Lab App G	G.01.12 or later
E6702C	cdma2000 Lab App C	C.01.12 or later
E6703C	W-CDMA Lab App C	C.01.17 or later
E6706C	1xEV-DO Lab App C	C.01.12 or later

E6785G Fast Switch Lab App G Supports:

G.00.15 or later

- GSM/GPRS
 - cdma2000
- W-CDMA
- 1xEV-D0

* Requires the 8960 test application's corresponding Option 405 digital bus software license (E1962B-405, E1966A-405). The E1987A Fast Switch Test App requires the corresponding Option 405 license to use a desired format.

Before setting up a measurement using an 8960, go to <u>http://wireless.agilent.com/rfcomms/refdocs</u> and read the user's guide for the appropriate 8960 application.

8960 Output Power

If mobile station testing is performed at frequencies that do not have amplitude offsets assigned to them, the test set will estimate an amplitude offset based on the nearest settings. This can cause unexpected results in your measurements. The recommended approach is to clear all entries in the 8960's RF IN/OUT Amplitude Offset table to prevent any undesired amplitude offsets. If you want to use the 8960's Amplitude Offset feature, make sure you fully understand its operation before setting up a measurement. For detailed information on Amplitude Offset for 8960 applications, go to http://wireless.agilent.com/rfcomms/refdocs and read the Amplitude Offset topic under Measurements for your desired application.

8960 Fading Measurement Example

To get you started with 8960 fading, we've included a measurement example to help you perform a W-CDMA DPCH block error rate (BLER) test using one of the PXB's predefined fading profiles and AWGN.

8960 Fading measurement example

8960 GPIB Connection and Remote Operation

It is possible to remotely operate an 8960 in a PXB test system environment. To do so, you will need to use Agilent "Remote GPIB" interfacing and configure your system as described in the following section on GPIB-only instruments:

Using GPIB-only instruments in controller-PXB test systems

Agilent 8960 Fading Measurement Example



The following measurement example performs a DPCH block error rate (BLER) test on a W-CDMA UE (i.e. DUTor MS) using an Agilent E5515C/8960 wireless communications test set with the E6785 Fast Switching Lab Application (ver. G.00.15 or later), and an Agilent N5106A PXB baseband generator and channel emulator.

1. Configure the Hardware

Detailed Steps

- 1. Connect PXB external reference output to the 8960 10 MHz reference input.
- 2. Connect a USB to GPIB converter from the PXB USB port to the 8960 GPIB port.
- 3. Connect an LVDS cable from the PXB digital bus port to the 8960's digital bus port. Note: The PXB digital bus port is also the logical port assignment that you will need to select when you add the 8960 to the PXB's list of external instruments. A1 is the default PXB digital bus port, and it is the upper-left port looking at the back of the PXB.
- Connect a W-CDMA test phone (UE) to the 8960 RF IN/OUT port. Note: It's also helpful to have a DC adapter for the phone so you don't run out of battery.

2. Set Up the 8960

Detailed Steps

- 1. Turn on the 8960. Press the SYSTEM CONFIG key immediately after powering on to select an application.
- If running the E6785 fast switch lab application, switch to the WCDMA format (SYSTEM CONFIG > F2/Format Switch > WCDMA).
- 3. Set the cell power to -50 dBm (CALL SETUP > F7/Cell Power).
- 4. Set the channel type to 64k RMC (CALL SETUP > F8/Channel Type).
- 5. Set the UE Loopback to "Type 2" (CALL SETUP > Call Control 3 of 6 > F6/RB Test Mode Setup > UE Loopback Type).
- Set the Uplink DTCH RMC CRC Presence to "Used for Data" (CALL SETUP > Call Control 3 of 6 > F6/RB Test Mode Setup > Uplink DTCH RMC CRC Presence).
- <u>Don't</u> originate call yet. Note: The fader must be enabled and in "Pass Through" mode before setting up a call. Otherwise, the call will be dropped as the connection to the PXB is established.

3. Set Up the PXB

Detailed Steps

- 1. Turn on the PXB.
- 2. Add 8960 to external instrument table.
- 3. In the configuration browser, under the Fade (ext in) node, select 1 Channel.
- 4. Set up the instrument configuration in the block diagram. Click on the triangle in the fist block and select the 8960 that you just set up in the external instrument table. Assign this instrument to IO Port A1. Then click the Load Configuration button.

- 5. Select W-CDMA/Mobile Station/Case 1 fading profile
- 6. Set up AWGN
 - o Signal To Noise Ratio = 9.00 dB
 - o Output MUX = Signal Only
 - o AWGN Enabled = ON
- 7. Fader Block = Pass Through (Thr)
- 8. If the PXB is in Manual calibration mode, you will need to press the Calibrate Power button before pressing Play.
- 9. Press the Play button

Note: Now the signal is running thru the fader, but is unimpaired (i.e. just pass thru). Now it is ok to setup a call. And then the fading and AWGN impairments can be added.

4. Verify Basic Unimpaired Operation

Detailed Steps

1. On 8960, originate call to verify that the UE connects and signal travels through PXB in Pass-Through mode.

Note: If you are having problems establishing a connection to the phone, make sure the PXB fader block is in Pass-Through ("Thr") mode, and the PXB AWGN Output MUX is set to Signal Only.

5. Perform DPCH block error rate (BLER) tests

Repeat the following steps to verify the Block Error Ratio for each DPCH power level value listed in the 3GPP TS 34.121-1 v8.6.0 specification.

Detailed Steps

- Set Cell 1 Connected DPCH Level to -13.9 dB (CALL SETUP > Call Control 2 of 6 > F3/Generator Info > F3/Downlink Channel Levels > F3/Connected DL Channel Levels > F2/WCDMA Conn DL Channel Levels > Cell 1 Connected DPCH Level).
- 2. Open the Block Error Ratio Measurement.
- Open Block Error Setup to set the desired number of blocks. In this example we will use 2000 blocks (the specification calls for 8200 blocks for statistical accuracy, but use a lower number for demonstration purposes to avoid long wait times).
- 4. On PXB:
 - o Set Output MUX to Signal + Noise
 - o Switch fader block state from Pass Through to On
- 5. Reset the Measurement so it starts again.
- 6. Observe the block count. You should see the count slowly update in increments of 500 blocks (this will take quite a few seconds). When finished, the 8960 will display the Block Error Ratio results.
- 7. Repeat Step 5 using the next DPCH power level in the specification.

Using GPIB-Only Instruments in Controller-PXB Test Systems

Some instruments used by the PXB may have only a GPIB interface (for example, the Agilent E5515C/8960 Wireless Communications Test Set). The PXB can connect to these instruments using its GPIB interface or a USB/GPIB adapter. However, the PXB cannot enable its GPIB port to simultaneously control a connected instrument and be controlled by a remote test controller. We have outlined two scenarios for connecting GPIB-only instruments in controller-PXB test systems. Choose the scenario that best fits your test environment.

In both scenarios, you will use Agilent "Remote GPIB" interfacing. In the first scenario, the GPIB-only instruments are connected directly to the PXB and the test controller accesses them through the PXB. In the second scenario, the GPIB-only instruments are connected directly to the test controller and the PXB accesses them through the controller using "Remote GPIB" interfacing. For both of these scenarios, the test controller must connect to the PXB using a LAN type interface.

- <u>Scenario 1: GPIB-only instruments connect directly to PXB</u>
- Scenario 2: GPIB-only instruments connect directly to controller

Scenario 1 - GPIB-Only Instruments Connect Directly to PXB

In this scenario, the controller connects to the PXB using LAN, the PXB connects to the GPIB-only instrument using GPIB or USB/GPIB, and the controller connects to the GPIB-only instrument using a "Remote GPIB" interface, as shown in the following illustration:



* Requires Agilent IO Libraries installed on controller with Agilent VISA as the primary VISA, or access to the Agilent VISA instead of the primary VISA for those GPIB-only instruments connected to PXB.

1.1 PXB Instrument Configuration

Perform the following steps on the PXB instrument:

1.1.1 Capture Instrument Settings in Agilent Connection Expert

Open the Agilent Connection Expert (Start -> Programs -> Agilent IO Libraries Suite -> Agilent Connection Expert).

If using GPIB interface, set this interface to be the system controller using the "Change Properties" button, then checking the "System controller (recommended)" box.

🍠 Agilent 82350 PCI GPIB Interface - GPIB1 🛛 🛛 🔀			
Modify configurable properties for this GPIB PCI interface card			
VISA interface ID:	GPIB1 💌		
GPIB address:	21		
System controller (recommended)			
SICL interface ID:	gpib100 🗸		
Logical unit	9		
Auto-discover instruments connected to this interface			
	Agient 488 Properties		
ОК	Cancel Help		

The Agilent Connection Expert GUI should look something like below, with the instruments appearing on the local GPIB interface (most likely GPIB1).

Write down the PXB hostname shown at the top of the tree. In this example it's "A-N5016A-00054".

Note the "GPIB1" interface properties. Write down the SICL interface ID (here it's gpib100). If using a USB/GPIB interface, the interface name in the GUI would most likely be "USB/GPIB0 (GPIB0)". The "0" is the GPIB port number, and can be different depending on how many GPIB interfaces are installed. The important information is the SICL interface ID of the GPIB interface the instruments are connected to.

Close the Agilent Connection Expert (File -> Exit).



1.1.2 Verify that the PXB Application is Running

It is important to make sure that the PXB application is running before configuring the controller. When the PXB application is running, the siclland.exe process is also running, providing the "Remote GPIB" capability. The PXB application automatically launches upon startup or reboot; however, it is safest to make sure the PXB application is running by checking for the N5106A PXB application in the Windows application bar. If the PXB application is not in the Windows application bar, re-launch the PXB application.

1.2 Controller Configuration

With the PXB application running on the PXB instrument and the system configured as shown above, perform the following steps on the controller:

1.2.1 Install Agilent IO Libraries 15.5 Suite

Download from Agilent website (http://www.home.agilent.com/agilent/product.jspx?nid=-34466.907863.00&lc=eng&cc=US).

Run the installer. If the user wants NI-VISA to be the primary VISA (if NI-VISA is already installed), make sure to select "Custom" in the "Setup Type" dialog, and make sure that "Install Agilent VISA as primary VISA" is not checked in the next "Install Agilent VISA" dialog. However, this makes test program access to the remote GPIB instrument more difficult. Installing Agilent VISA as primary eases test program access and shouldn't interfere with access to other instruments.

The rest of the install can proceed with default settings.

Agilent IO Lib	raries Suite 15.5 - InstallShield Wizard	X
Setup Type Chapse the s	etup type that best cuits your needs.	
Please select	t a solup type.	
O Typical	Recommended features for your configuration will be installed.	
⊙ Custon	Choose the program features you want to install. Recommended for advancial users	
Instal Shield		
	<back next=""> Ca</back>	leone



1.2.2 Set up Remote GPIB Interface in Agilent Connection Expert

Open the Agilent Connection Expert (Start -> Programs -> Agilent IO Libraries Suite -> Agilent Connection Expert).

Add a remote GPIB interface by right-clicking on "SSDXP65" (this will be the computer name of the computer that the Agilent Connection Expert is installed on), then selecting "Add Interface".

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Task Guide 🛛 🗙	Instrument 5/0 on this PE	System Name - SSDXPGS
System tasks	Pulval Al	The matureau I/C system controlled by the PC
Add on instrument Add on instrument		
More Information Item to Ladd as inclusion? Item to Ladd as inclusion? How to Ladd as inclusion?		
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In the GUI opened (as shown below), select "Remote GPIB (via E5820 or Remote IO Server)", and then press the "Add" button.

😽 Monually Add on Interface 🛛 🛛 🔀
Select one of the listed interfaces to add to the system configuration.
Available Interface types: LAN Interface Remote GPU (via CSU I 0 or Remote IO Server) Remote IS-232 (via ES310 or Remote IO Server) Remote IO (via Remote IO Server) CPB-Vol Interface
Interface Description: A GPD Interface on an ES010A or a remote I/O server
Add Ganoal Help

2. Remote GPIB interface - Remote		×	
Set configurable properties for this remote GPI	B interface		
VISA interface ID, board number:	CFID1		
TCPIP interface ID:	тсрірр		
- Connection Information Find Interfaces			
Hostname: hostname.net.com			
O IP address:			
Interface name on remote host gpip0			
Test connection			
SICL interface ID:	gpib] 🗸		
Logical unit	9 💌		
Auto-discover instruments connected to this interface			
	Agieri 48 Properties		
×	Cancel Halp		

In the "Hostname" field, enter the PXB hostname or select IP address and enter the PXB IP address.

In the "Interface name on remote host" field, change the name to the host SICL interface ID. For this example, it is gpib100. Once these fields are updated, press the "Test connection" button.

Below is the "Remote GPIB interface - Remote" GUI updated with hostname, SICL name, and connection tested.

2. Remote GPIB interface - Remote			
Set configurable properties for this remote	GPIB Interface		
VISA interface ID, board number:	CPD1		
TOPIP Interface ID:	тсріро		
- Connection Information			
Find Interfaces			
Hostname: A-NS106A-000	54		
OIPaddress:			
Interface name on remote host	gpio100		
Test connection The interface was successfully opened			
This item has been verified			
SICL interface ID:	gpib1		
Logical unit	9		
Auto-discover instruments connected to this interface			
	Agient 488 Properties		
ОК	Cancel Halp		

Close this window by pressing "OK" button.

Close Agilent Connection Expert (File -> Exit).

Scenario 2 - GPIB-Only Instruments Connect Directly to Controller

In this scenario, the controller connects to the PXB using LAN, the controller connects to the GPIB-only instrument using GPIB or USB/GPIB, and the PXB connects to the GPIB-only instrument using a "Remote GPIB" interface, as shown in the following illustration:



*Requires Agilent IO Libraries installed on controller but Agilent VISA doesn't have to be the primary VISA.

2.1 Controller Configuration

With the system configured as shown above, perform the following steps on the controller:

2.1.1 Install Agilent IO Libraries 15.5 Suite

Download from Agilent website (http://www.home.agilent.com/agilent/product.jspx?nid=-34466.907863.00&lc=eng&cc=US).

Run the installer. If the user wants NI-VISA to be the primary VISA (if NI-VISA is already installed), make sure to select "Custom" in the "Setup Type" dialog, and make sure that "Install Agilent VISA as primary VISA" is not checked in the next "Install Agilent VISA" dialog.

The rest of the install can proceed with default settings.

Agilent IO Libraries Suite 15.5 InstallShield Wizard		
Setup Type Choose the setup type that best outs your needs.		
Please select a value type.		
Typical Recommended features for your configuration will be inst	aled	
Clustern Choose the program features you want to instal. Recom advancial users	mended for	
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Agilent IC	Libraries Suite 15.5 - InstallShield Wizard	×
install A	Agilent VISA.	
National Ir Formore in (rever.agik	nstruments's VISA is ourrently installed in the standard VISA directory as the primag normalism, see the Agilert ID Literation State Connectivity State ent.com/Ind/connectivityguide)	VISA.
	Lice the check box to keep the other vendor's VISA as the primary VISA, and indvill Agient VISA in side by side mode.	
Select the check box to replace the other vendor's VISA with Agilent VISA as the primary VISA, and renome the other vendor's VISA to visa32.dll bak.		
	Install Agient VISA as prinary VISA	
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2.1.2 Capture Instrument Settings in Agilent Connection Expert

Open the Agilent Connection Expert (Start -> Programs -> Agilent IO Libraries Suite -> Agilent Connection Expert). The Agilent Connection Expert GUI should look something like below, with the instruments on the local GPIB interface (most likely GPIB0).

Write down the controller hostname shown at the top of the tree. In this example it's "SSDXP65".

Note the "GPIB0" interface properties. Write down the SICL interface ID (here it's gpib0). If using a USB/GPIB interface, the interface name in the GUI would most likely be "USB/GPIB (GPIB0)". The "0" is the GPIB port number, and can be different depending on how many GPIB interfaces are installed on the controller. If a GPIB interface card was installed in the controller, then the USB/GPIB interface added, the USB/GPIB name would most likely be "USB/GPIB (GPIB1), and the SICL interface ID gpib1. The important information is the SICL interface ID for the GPIB interface the instrument are connected to.

Close the Agilent Connection Expert (File -> Exit).



2.1.3 Start the Agilent Remote IO Server

Start the Agilent Remote IO Server (Start -> Programs -> Agilent IO Libraries Suite -> Utilities -> Remote IO Server). A DOS window opens. You can minimize this window, but <u>do not</u> close it. The Remote IO Server can be started automatically at boot up through the Agilent Connection Expert (Tools -> Remote IO Server -> Configure: select "Auto-start remote IO server on machine startup", press OK to close). If started automatically, there isn't a DOS window opened.



2.2 PXB Instrument Configuration

Perform the following steps on the PXB instrument:

2.2.1 Set up Remote GPIB Interface in Agilent Connection Expert

Open the Agilent Connection Expert (Start -> Programs -> Agilent IO Libraries Suite -> Agilent Connection Expert).

Add a remote GPIB interface by right clicking on "A-N5106A-00054" (this will be the computer name of the PXB that Agilent Connection Expert is installed on), then selecting "Add Interface".

E Aglient Connection Expert		
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task Guide 🛛 🗙	Instrument E/O on this PC	System Name - A-NSL06A-00054
System tasks	Pairesi Al	The resource CO system controlled by The PC
🖓 Retrech e	🖃 😹 <mark>6-8:51069-00054</mark>	
Add an instrument	Real LAN (TCFIPO)	
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In the GUI opened (as shown below), select "Remote GPIB (via E5820 or Remote IO Server)", and then press the "Add" button.

🐱 Manually Add an Interface	
Select one of the listed interfaces to add to	the system
configuration.	
Available interface types:	
LAN interface	
Remote GPB (via CSB10 or Remote IO Servi Remote IS-282 (via ESB10 or Remote IO Servi Remote USD (via Remote IO Server) GPB-V/0 interface	er) Grvet)
Interface Description:	
A GPID Interface on an ES810A or a remote	VO server
Add Ganad	Holp
	-11
9 Demote CDIR Interface - Remote	
Set configurable properties for this remote G	PIB interface
VSA Interface ID, hoard number:	CEBD
TONE interfaces To	
I GAIP INTERTICE ID:	TCPIPD
Connection Information	
Find Interfaces	
Hostname: hostname ret.com	
OIP address:	· ·
interface name on remote host gr	olo0
Test connection	
SICL interface ID:	gpib] 🗸 🗸
Logical unit:	10 💌
Auto-discover instruments connecte	d to this interface
	Agieni 488 Properties
	Cancel Halp

In the "Hostname" field, enter the controller hostname or select IP address and enter the controller IP address.

In the "Interface name on remote host" field, change the name to the host SICL interface ID. For this example, it is gpib0. Once these fields are updated, press the "Test connection" button.

Below is the "Remote GPIB interface – Remote" GUI updated with hostname and SICL name, and connection tested.

2. Remote GPIB interface - Remote	X	
Set configurable properties for this remote GP	IB interface	
VISA Interface ID, board number:	CPIDD 🔽	
TOPIP Interface ID:	торіро 💌	
- Connection Information		
Find Interfaces		
Hostname: ssdxp65		
O IP address:		
interface name on remote host gpi	50	
Test connection The interface was successfully opened		
This item has been verified		
SICL interface ID:	gpibl 💌	
Logical unit	10 💌	
Auto-discover instruments connected to this interface		
	Agileri 48i Properties	
	Cancel Halp	

Close this window by pressing "OK" button.

Close Agilent Connection Expert (File -> Exit).